REMARKS

This application has been carefully reviewed in light of the Examiner's Action dated September 15, 2003. Claims 14-22 have been amended to clarify the claimed subject matter and claims 1-13 and 25-41 have been canceled without prejudice. Reconsideration and full allowance are respectfully requested.

The Examiner rejected claims 14-24 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Independent claim 14 has been amended to clarify that the thickness of the <u>core</u> varies between first and second positions while the <u>overall thickness</u> of the composite structure at those positions is the same. The Examiner also rejected claim 18 as being indefinite. Claim 18 has been amended to clarify the claimed subject matter. It is believed this rejection has been overcome.

The Examiner rejected claims 14-17, 20, 21, 23, and 24 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,935,704 to Happy in view of U.S. Patent No. 5,895,699 to Corbett, et al. This rejection is respectfully traversed for the reasons set forth in detail below.

As presented, independent claim 14 is directed to a process for producing a tubular composite structure having at least one integrally reinforced section. The process comprises the steps of first applying a first face sheet onto the outside surface of a mandrel having a longitudinal axis (e.g., a cylindrical mandrel). The first face sheet is covered on its outside surface with a core layer that has first and second thicknesses at first and second positions relative to the longitudinal axis of the mandrel. The first and second thicknesses of the core are different. That is, the thickness of the core layer varies relative to positions along the length of the mandrel. A second face sheet is applied to the outside surface of the core layer such that the first face sheet, the core, and the second

face sheet define a composite structure that has the same overall structural thickness at the first and second positions. The composite structure is then cured and removed from the mandrel.

In order to produce a composite structure having the same thickness at first and second positions while utilizing a core that has a different thickness at those positions, the thickness of either or both the first and second face sheets is adjusted. Stated otherwise, the relative proportions of the first and second face sheets and core may be varied at the first and second positions. For example, in a position where the core thickness is reduced relative to another position, one or both of the face sheets may have an increased thickness. In this instance, the stiffness and/or bearing strength of a position with a reduced core thickness may be increased without changing the outside dimensions (i.e., sidewall thickness) of the composite structure. That is, such a position within the composite structure may be internally or 'integrally' reinforced while maintaining the same thickness of other positions along the length of the structure (e.g., a constant sidewall thickness).

Integral reinforcement allows the stiffness and bearing strength of the composite structure to be adjusted (i.e., by varying the relative proportions of the face sheets and core) without changing the outside dimensions of the composite structure. This allows for altering the structural properties of a composite structure (e.g., post-design changes) without adjusting interfacing hardware, structures or tooling. This is especially important in complex systems such as space launch vehicles where altering one component may require redesigning and/or altering a numerous interfacing components. Further, integral reinforcement of tubular structures allows for creating reinforced section(s) in such structures without the use of a stepped mandrel having a varied diameter along its length, which may prevent the cured composite structure from sliding off of the mandrel thereby requiring the use of an expensive, complex collapsible mandrel. That is, integral reinforcement allows for producing a tubular composite structure having one or more reinforced sections that may be slid off of a smooth

mandrel. As claimed, independent claim 14 provides an integrally reinforced composite structure wherein the relative proportions of first and second face sheets and a core material vary between first and second positions along the length of the structure while the overall thickness of the structure at the first and second positions is the same.

As presented, Happy is directed to a method for forming an elongated filament-wound object (e.g. a pole) having a non-uniform wall thickness. See column 1, lines 9-19. In this regard, the elongated filament-wound object described by Happy has a sidewall thickness that is greater at its base than at its tip. This increased thickness results from the presence of additional layers of filament-wound reinforcements at the base of the object. See for example column 3, lines 8-14. Happy fails to disclose the use or the desirability of utilizing an intermediate core disposed between first and second face sheets to increase the stiffness of a resulting composite structure. Accordingly, Happy fails to disclose or suggest an integrally reinforced composite structure wherein the relative proportions of face sheets and a core material making up that structure are varied between first and second positions along the length of the structure while the overall thickness of the structure at first and second positions is the same.

Corbett discloses a method for reducing core crush in a honeycomb structure by utilizing a peripheral tie down ply to maintain the core of the composite laminate at a desired location during curing. However, Corbett fails to disclose a composite structure having a first and second positions along its length wherein the relative proportions of the first and second face sheets and a core disposed between those face sheets varies while the overall thickness of the structure at those positions is the same. As shown in Figure 6 of Corbett, the thickness of the composite structure varies in direct relation to the thickness of the core section 106. In particular, as the thickness of the core section 106 decreases, the overall thickness of the composite structure also decreases. This

teaches away from the claimed subject matter of claim 14. As presented, Corbett fails to disclose an composite structure wherein the relative proportions of face sheets and a core material making up that structure may be varied between first and second positions along the length of the structure to provide one or more integrally reinforced sections while the overall thickness of the structure at those positions is the same.

Thus, the combination proposed by the Examiner does not yield the subject matter of claim 14. In this regard, Happy teaches a filament-wound composite structure without a core structure that has a non-uniform wall thickness along its length and Corbett teaches a composite structure having an overall thickness that changes in direct relation to the thickness of a core disposed between opposing face sheets. Therefore, neither of the references teaches or suggests an integrally reinforced composite structure wherein the relative proportions of first and second face sheets and a core material vary between first and second positions along the length of the structure while the overall thickness of the structure at the first and second positions is the same. Accordingly, Applicant submits that independent claim 14 and its dependent claims are allowable as presented and respectfully requests that this rejection be withdrawn.

Applicant also submits that the combination proposed be the examiner is improper. Happy is directed towards production of utility poles while Corbett is directed toward composite sandwich panels for use in aerospace applications. It is unclear why one addressing aerospace concerns would not be motivated to seek the disclosure of Happy. Likewise, it is unclear why one addressing utility pole construction would seek the disclosure of Corbett. Not withstanding the Examiner's assertion of a motivation to combine, Applicant respectfully submits that the "sliding" referenced in Happy is directed towards sliding between reinforcing filaments placed during a filament winding process whereas the "slipping" referenced in Corbett is between the faces sheets and core material of a

composite sandwich structure. Happy does not utilize a core structure and Corbett does not utilize a filament winding process. Therefore applicant submits that Happy and Corbett are directed to exclusive problems and there is no motivation to make the combination suggested by the Examiner. Moreover, it is unclear that Happy and Corbett could be operatively combined. Happy discloses a method for producing a filament wound pole that does not include a core material. Corbett is directed towards composite honeycomb structures where resin impregnated sheets are adhered to a honeycomb core to create a panel. There is simply no motivation to combine the cited references.

Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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Date: December 15, 2003